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TWO NEW SEARSID FISHES OF THE GENERA *MAULISIA* AND *SEARSIA* (PISCES: SALMONIFORMES)

Tetsuo Matsui and Richard H. Rosenblatt

ABSTRACT

A new *Maulisaia* and a new species of *Searsia* are described. *Maulisia argipalla* new species differs from *M. mauli* in vertebral number, shape of the thoracic light organ, and in the relative size of the supraorbital bone. *M. mauli* is known only from the eastern North Atlantic. *M. argipalla* has been taken in the North Atlantic and the eastern Pacific. The genus *Maulisia* is characterized, and *M. microlepis* Sazonov and Golovanj 1976 and *M. acuticeps* Sazonov 1976 are excluded from it. *Searsioides* Sazonov 1977 is placed in the synonymy of *Searsia* Parr 1937. *Searsioides multispinus* Sazonov 1977, the type species, is included in *Searsia* on the basis of the possession of photophores and the lack of a lateral line canal that is lined by modified scales and the lack of a shoulder pit or dermal pit behind the shoulder girdle. *Searsia calvala* new species from the Halmahera Sea is described. *S. calvala* and *S. multispinus* jointly differ from *S. koefoedi* in having a cleithral spine, and in the configuration of the posttemporal bone, and from each other in gillraker and scale number, position of the dorsal and anal fins, and presence or absence of scales on the pectoral base.

Searsids are midwater alepocephaloid fishes distinguished by the presence of a sac containing luminous fluid beneath the cleithrum. The only revision of the group is that of Parr (1960), who recognized 12 genera and 17 species. Recently Sazonov (1976a) and Sazonov and Golovanj (1976) have introduced 10 additional species. Although we cannot allocate all of their new forms to genera with certainty, it is clear that our material contains specimens of as yet undescribed species. It is the purpose of this paper to describe these new forms and redefine the genera *Maulisia* and *Searsia*.

After this paper had been accepted for publication, Sazonov (1977) described a new genus and species, *Searsioides multispinus*. This proved to be the same as a form which we were describing as a new species of *Searsia*. We have added a discussion justifying our inclusion of the species in *Searsia*, and have used Sazonov's trivial name, but have not otherwise materially altered our description.

MATERIALS AND METHODS

Interorbital distance was measured at mideye, and thus may not represent minimum interorbital width. Other measurements and the counts are as defined in Hubbs and Lagler (1958) or self explanatory. Measurements were made with needle point dividers, and small measurements were made under magnification. The pores found under the scales are located in the anterior half of the scale pocket and the scale and overlying membrane of the scale pocket must be lifted to see them. The pores measure about 0.05–0.6 mm in diameter except for *S. calvala* in which they are smaller. Photophore terminology is that of Parr (1960) with the division of "GO" to GO_1 and GO_2 and the addition of the SBO (subopercular organ), (Matsui and Rosenblatt, 1971). Terminology for cephalic lateral line canals follows that of Reno (1969). Counts, and descriptions of bony parts, were made from intact specimens or from radiographs.

Specimens utilized in this study are from the Fish Collection of the Scripps Institution of Oceanography (SIO), the Institut für Seefishcherei, Hamburg (ISH), and National Museum of Natural History (USNM).

Maulisia Parr 1960

Maulisia Parr, 1960: 81–82, Type species: *Maulisia mauli* Parr 1960, by original designation.

Generic description.—Body deep and compressed, with the cleithral symphysis produced as an exposed, conspicuous spine. Lateral line marked by papillae or neuromasts, without modified scales. A large dorsoventral slit of about 2–5 scale rows long, located behind the upper posterior margin of the supracleithrum (shoulder pit of Parr, 1960) in specimens larger than about 50 mm SL. One to several (mostly 0.2–0.5 mm diameter) pores in all or most scale pockets over anterior half of body, becoming somewhat fewer posteriorly.

Photophores weakly developed and generally ventrally located. A small IVO in young stages disappearing by 100 mm SL. A rudimentary GO_2 appears at about 30 mm and is lost by 100 mm SL. GO_1 and BRO weakly developed. Other photophores present are: round or transverse THO, round MVO, PO, SVO, PAO, SAO and ICO.

Mouth large, maxillary extending behind eye. Premaxillary tusks present. Teeth on premaxillary relatively large and widely spaced. A short outer tooth row on middentary present in young, usually lacking in larger fish. Similarly, teeth on basihyal, palatines, and mesopterygoids present in smaller individuals but lacking in larger ones. Vomer with 2 teeth.

Top of skull flattened, slightly concave. Frontals expanded over eye in a wedge, and articulating laterally with a large, downward sloping supraorbital over anterior half to third of eye. Supraorbital extending anterior to eye and articulating with a rod-shaped antorbital. Gill opening wide, dorsal margin level with top of eye. Cephalic lateral line canals well branched. The canal of the cephalic lateralis passes over the pectoral girdle to the posterior margin of supracleithrum and not through canals or grooves in the posttemporal and supracleithrum.

Remarks.—Parr (1960) established *Maulisia* for the reception of *M. mauli* giving the following characters: presence of a shoulder pit, presence of photophores, lack of enlarged lateral line scales, small body scales, horizontal expansion of the frontals over eye in a broad triangle, wide subvertical "prefrontals" (= supraorbitals), dorsal origin before that of anal fin, and lack of external lateral teeth on lower jaw (only true for large individuals).

Recently, Sazonov and Golovanj (1976) described a new *Maulisia* (*M. microlepis*), which differs from Parr's generic description in the first two characters listed above. The shoulder pit, a very conspicuous feature found only in this genus, is absent in *M. microlepis*. Sazonov (1976a) described another *Maulisia* (*M. acuticeps*) lacking enlarged lateral line scales but which also lacked photophores and a shoulder pit.

Judging from Sazonov's (1976b) generic key, these species were placed in *Maulisia* because of the shape of their frontals and supraorbitals—characters also shared by *Mentodus crassus* Parr 1960. Without more detailed descriptions, the generic allocation of these two new species is uncertain. We are of the opinion that they should not be in *Maulisia*.

Maulisia mauli Parr 1960
Figure 1

? *Holtbyrnia* (*Mentodus*) *polycaeca* (not of Parr 1937) Parr, 1951: 16.
? *Searsia polycaeca* (not of Parr 1937) Tucker, 1954: 204–205 (Discovery specimen only); Grey, 1955: 118.
Maulisia mauli Parr, 1960: 82–86, fig. 56–60. Holotype: No. 9594, Museu Municipal do Funchal, Madeira, 170 mm SL, from stomach of *Aphanopus carbo*, Madeira; Krefft, 1973: 96–97 (in part); ? Jonsson, 1973: 219.

Diagnosis.—A *Maulisia* with 43–45 vertebrae and a transverse THO (Fig. 2a). The top of head is widest at the frontals, which are usually indented or notched just anterior to their widest point (Fig. 3a–b). Posterior margin of maxillary separated from preoperculum by more than half an eye length. Medial row of gillrakers on 2nd arch either complete or with one or two lacking. White tissue extending along the posterior third of eye ventrally.

Description.—Greatest body depth 3.5–4 in SL. Caudal peduncle depth about 3 in

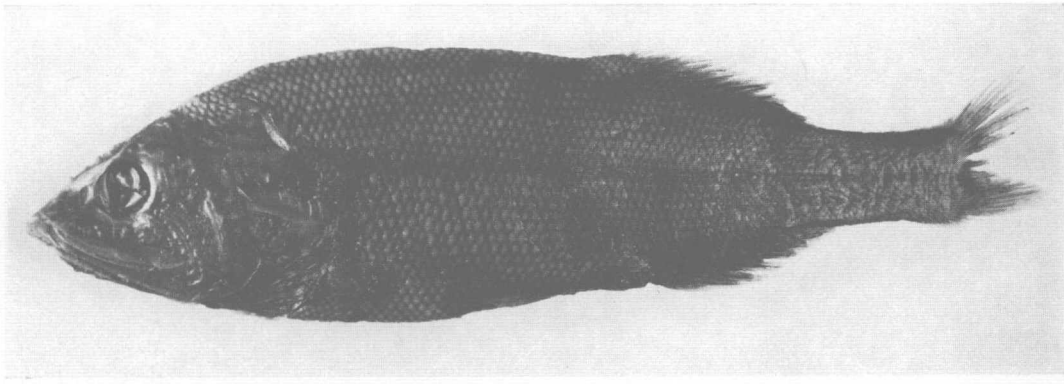

Figure 1. *Maulisia mauli*, 178 mm SL, ISH 591/68, eastern North Atlantic.

greatest body depth. Top of head widest at frontals, which flare out from about mideye to the widest point over rear one third of eye. Usually a notch (more noticeable in larger specimens) just before widest point. A down-turned supraorbital with outer margin parallel to frontals, extending from just in front of widest point to before eye, and loosely connected to rod-shaped antorbital. Nasal rosette with 7–11 lamellae. Posterior border of maxillary a short distance behind eye, half an eye length or more before preopercular margin. Infraorbital canal running along lacrimal about a third of the way up from its ventral margin.

THO photophore a transverse bar. A longitudinal JO reported in holotype, not present in our material. White tissue around posterior border of the orbit, then extending anteriorly around the ventral margin along the posterior third of eye. Pelvic base and anal papilla separated by approximately 14–16 scale rows.

Scales 79–95 along midline. D 17–21, A 15–18, P_1 17–19, P_2 7–8, vertebrae 24 + 19–21 (43–45), Br 8, GR 7–8 + 1 + 14–17 (23–26).

Distribution.—Eastern North Atlantic. The holotype is from Madeira. We have examined specimens from 12°07′N, 23°08′W (ISH 591/68 and 32°47′N, 16°24′W (ISH 3003/71). Other records range from 8°26′N, 15°11′W (Parr, 1960) to 62°56′N, 22°02′W (Jonsson, 1973), however, it is uncertain whether some of these are actually *M. mauli*. Krefft (1973) gives a depth range of 400–700 m for the species.

Material examined.—ISH 591/68 (4), ISH 3003/71 (3).

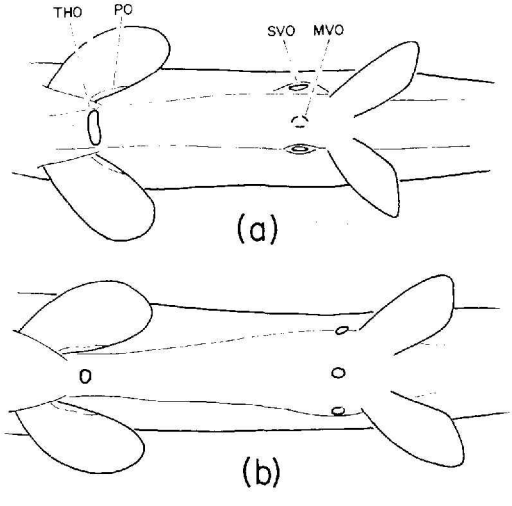

Figure 2. Camera lucida drawings of the ventral surface of *Maulisia* showing THO, SVO, and MVO photopores. PO and pectoral and pelvic fins drawn in freehand. a) *M. mauli*, 90 mm SL, ISH 591/68. b) *M. argipalla* new species, 129 mm SL, holotype, SIO73-392.

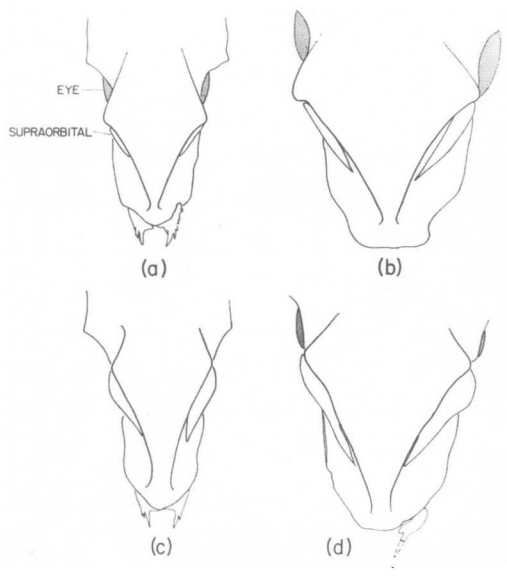

Figure 3. Camera lucida drawings of the dorsal view of head of *Maulisia* illustrating the interspecific differences in supraorbital development. a) *M. mauli*, 90 mm SL, ISH 591/68. b) *M. mauli*, 180 mm SL, ISH 591/68, premaxillaries missing. c) *M. argipalla* new species, 100 mm SL paratype, SIO70-8. d) *M. argipalla* new species, 171 mm SL, paratype, ISH 2199/68, most of the premaxillaries missing.

Maulisia argipalla new species
Figure 4

Holtbyrnia (*Mentodus*) *polycaeca* (not of Parr 1937), Maul, 1954: 41–47, fig. 14–16; 1957: fig. 1e.
Maulisia mauli Bussing, 1965: 19; ? Quero, 1969: 550; 1970: 271–272, fig. 11.

Diagnosis.—A *Maulisia* with 46–47 vertebrae, a round THO (Fig. 2b) and a wide supraorbital that extends laterally beyond the widest part of the frontal (Fig. 3c–d). Margin of frontal adjacent to supraorbital relatively straight and without a notch. Posterior margin of maxillary much less than half an eye length from preoperculum. Ceratobranchial of second arch lacking most of its medial gillrakers. White tissue bordering posterior margin of orbit extending anteriorly halfway around eye ventrally.

Description.—Counts and measurements of holotype and paratypes are in Table 1. The description is of the holotype and the paratypes agree, unless otherwise indicated. Body compressed (greatest width 2.4 in greatest depth) and deep (3.8 in SL) with a shallow caudal peduncle (depth 4.3 in greatest body depth). Caudal peduncle depth about 3 in greatest body depth in most paratypes. Venter only narrowly flattened. Head large, its length 3 in SL. Dorsal profile of head nearly level with body profile, with ventral profile tapering from nearly greatest body depth to a pointed snout. Dorsal profile more strongly sloping in paratypes. Mouth large, upper jaw 1.8 in HL, with maxillary extending behind eye by about three-fourths eye diameter, and separated from preoperculum by about one-fourth eye diameter. Maxillaries relatively deep. Upper half of anterior supramaxillary and anterior part of posterior supramaxillary not over-

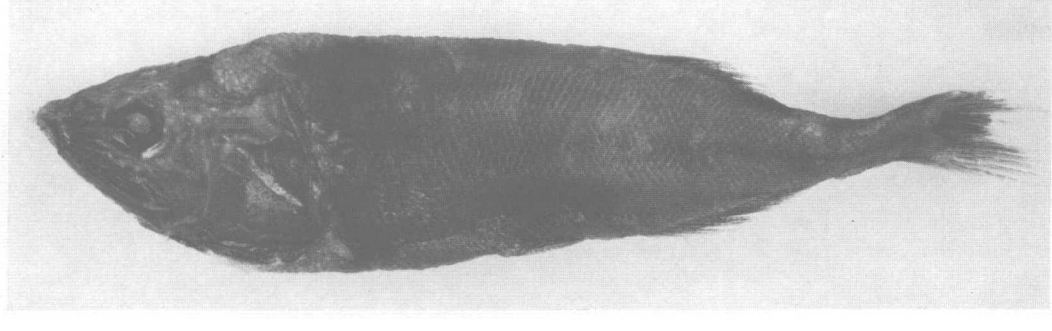

Figure 4. Holotype of *Maulisia argipalla* new species, 129 mm SL, SIO72-392, San Clemente Basin (eastern North Pacific).

Table 1. Measurements in millimeters, and counts of the type material of *Maulisia argipalla* (first column is the holotype)

Measurement or count	SIO72-392	SIO67-104	SIO7)-8	SIO65-444	ISH 2199/68
SL	129	117	97	56	171
Head	42	42	34	21	54
Upper jaw	23	23	18	11	31
Eye	8.2	8.8	7.)	5.5	9.9
Interorbital	12	12	9.4	4.8	15
Snout	10	11	9.1	5.4	13
Preanal	89	79	65	38	116
Prepelvic	70	62	53	31	89
Predorsal	86	78	64	37	112
Anal base	22	20	18	8.6	29
Dorsal base	20	25	20	10	34
Length caudal peduncle	24	29	14	9.1	29
Depth at angular	24	25	19	10	34
Depth at pelvic	30	28	19	8.2	39
Least depth caudal peduncle	7.9	10	7.8	3.2	15
Greatest depth	34	32	23	12	43
Dorsal	17	20	19	19	20
Anal	16	17	17	15	16
Pectoral	19	19	18	—	19
Pelvic	7/7	7/7	7/8	–/8	7/7
Branchiostegals	8/8	8/8	8/8	9/9	8/8
Gillrakers	7 + 1 + 15	7 + 1 + 16	7 + 1 + 16	7 + 1 + 17	7 + 1 + 16
Vertebrae	25 + 22	26 + 21	27 + 19	—	25 + 22
Scales along midline	86	77	84	—	90

lapped by lacrimal. Eye relatively small, 3 in HL. White tissue around posterior border of orbit extending anteriorly halfway around eye ventrally (on 2nd–3rd to 5th infraorbital bone). Snout 4.2 in HL, and longer than eye length. Frontals wedge-shaped, narrow anteriorly, then expanded, with the widest point just behind mideye, then narrowing again. Skull nearly diamond-shaped when viewed from above (Fig. 3c–d). Lateral margins of head expanded by a large supraorbital joined loosely to frontals anteriorly from their widest point, and extending about a fourth of length of supraorbital in front of the eye. Supraorbital angling down and out over eye, and joined anteriorly to a rod-shaped antorbital. Nasal rosette with 8 or 9 lamellae; mostly 7 in smaller paratypes. Nasal capsule separated from orbit by a distance greater than its diameter (2.9 mm) and from tip of snout by twice its diameter.

Premaxillaries short, each with 4–5 widely spaced teeth and an anteriorly directed, slightly incurved tusk. Tooth nearest to each tusk enlarged and subhorizontal. Premaxillary teeth more numerous in smaller paratypes, numbering as many as 10 with 2–3 adjacent to tusk enlarged and subhorizontal. Tusks widely spaced, with a truncated edentulous space between them. The teeth on the upper jaw are thus along the lateral border. Right maxillary with about 50 teeth that are about half as large as those of premaxillary. Dentary teeth smaller than maxillary teeth, a row of about 60 on left side. A single base of a tooth on anterolateral face of dentary. Two small teeth on vomer. A single inward directed tooth on each palatine. A single tooth on each

mesopterygoid. Two teeth on 2nd basibranchial. Basihyal edentulous, except that a single tooth was found in a 56 mm SL paratype. Small infrapharyngeal teeth on 2nd–4th arch. Small teeth on 5th ceratobranchial.

Cleithral symphysis elongated into an anteriorly directed, exposed spine. Lateral margin of cleithrum also exposed. A large opening at eye level just behind cleithrum (shoulder pit) bordering 4 scale rows ventrodorsally and covered by a large scale. Right side scale intact, left missing. Shoulder pit in paratypes bordering 2 to 5 scale rows with larger individuals having larger pits. Normal sized scales dorsal and ventral to shoulder pit, with holes nearly its size in scalepockets.

Scales small, about 85 along midline. Most scalepockets over anterior half of body with single or multiple pores under the scales; progressively fewer posteriorly. Lateral line with few black papillae anteriorly, otherwise unmarked. Near the shoulder girdle the lateral line canal turns dorsally, passing along the posterior margin of the shoulder pit and meeting the cephalic lateralis just above it at the supracleithrum.

The cephalic lateral line canals are not completely encased in bone. The canals consist of the following: (1) supraorbital canal—from nasal sac to the supratemporal canal; (2) infraorbital canal—from anterior third of lacrimal around the orbit and intersecting the postocular commissure, with branches intersecting those of the supraorbital canal on the right side (incomplete in paratypes) but not on the left; (3) preoperculomandibular canal—from near the mandibular symphysis intersecting the postocular commissure; (4) postocular commissure—from infraorbital canal to junction of cephalic lateralis and supratemporal canal; (5) supratemporal canal—complete; (6) cephalic lateralis—from junction of postocular commissure and supratemporal canal to body lateralis. Ossified tube of the cephalic lateralis reaches the supracleithrum near its dorsal tip, from which point the canal continues posteriorly as a tube of soft tissue across the supracleithrum to the body lateralis.

The infraorbital canal is mostly in bone except for the anterior half of the 2nd infraorbital and along the lacrimal, where it is covered by soft tissue ventrally. The 2nd infraorbital slightly overlaps the anterior supramaxillary and extends as far back as the anterior half of the posterior supramaxillary. The 3rd infraorbital is the largest but does not extend to the preoperculum.

Ventral surface of body slightly flattened. Photophore at THO round, located approximately a third of the distance between pectoral and pelvic fins (approximately 10 scale rows posterior to pectoral base). A scale on the anterior side of THO with its edge excluded from face of photophore. GO_1 with a small white-body. GO_2 rudimentary, marked only by transparent tissue. BRO and PO small, with a small white-body. The short transverse MVO is covered by thin black tissue. SVO just anterior to pelvic bases. SAO just dorsal to anus. PAO and ICO barely discernible. IVO present only in smallest (56 mm SL) paratype, absent in holotype and other paratypes.

Subopercle oblong, and parallel to branchiostegal rays. The similarly shaped but smaller interoperculum is in a line with it. Four branchiostegal rays on epihyal flattened, but the widest only half as wide as suboperculum. Four acinaciform rays on ceratohyal.

Dorsal origin before anal fin by about one-fourth its basal length (about 6 rays). Pelvic base about 12 scale rows before anus.

Distribution.—Eastern North Atlantic, and the eastern Pacific off California and Baja California in the north and off Peru and Chile in the south. Taken in nets sampling below 1,000 m.

Etymology.—From the Greek *argos*, white or bright, and *palla*, a ball, in reference to the round THO.

Material examined.—Holotype: SIO72-392, 1(129 mm), San Clemente Basin, 32°14.5′N, 117°57.7′W,

caught in a 10-ft Tucker trawl at about 1000 m depth on 17 October 1972 by J. Childress and R. Lee. Paratypes: SIO67-104, 1(117 mm), 35° 03.2'N, 122°52.6'W; SIO70-8, 1(97 mm), 31°35.0' N, 118°16.0'W, SIO65-444, 1(56 mm), 32°19.6'N, 118°37.8'W; ISH 2199/68, 1(171 mm), 12°07'N, 23°08'W (collected with *M. mauli*, ISH 591/68).

Searsia Parr 1937

Searsia Parr, 1937: 8, 12–16. Type species: *Searsia koefoedi* Parr 1937, by original designation.
Searsea Maul, 1948: 12 (invalid subsequent spelling).
Searsioides Sazonov, 1977: 55. Type species: *Searsioides multispinus* Sazonov 1977, by original designation.

Generic description.—Body elongate and compressed. Scales small, about 75–120 along midline. Lateral line without modified scales, nearly unmarked, with translucent or dark thin tubes, or branched nerve endings. Pores under scales mostly smaller than 0.3 mm diameter, none as large as scales.

Photophores mostly ventral. A small IVO only in young. GO_2 rudimentary, appearing relatively late in the young and marked by a transparent spot. The following photophores found in juveniles and adults: BRO, PO, SVO, SAO, PAO, ICO, transverse THO, and a transverse or round MVO. The SVO, SAO, and PAO close to bases of pelvic and anal fins. BRO weakly developed. GO_1 small or absent, and OPO, and SBO present or absent.

Premaxillary tusks large. Basihyal teeth of young in a circular pattern, sometimes with several medial teeth anterior and posterior to ring; generally fewer basihyal teeth with increase in size. Palatine teeth small or lacking.

Comparisons.—The three species of *Searsia* are distinguished from all other searsids in possessing photophores but lacking a lateral line canal that is lined by modified scales, and an opening (shoulder pit) or openings (dermal pit) behind the supracleithrum.

Discussion.—Sazonov (1977) erected *Searsioides* as a monotypic genus for the reception of *S. multispinus*. The new genus

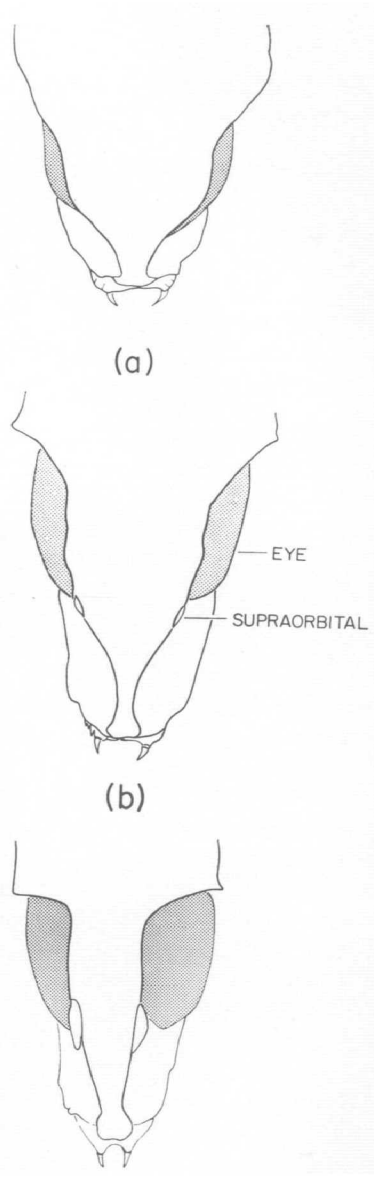

Figure 5. Camera lucida drawings of dorsal view of head of *Searsia* illustrating interspecific differences in supraorbital development and dentition. a) *S. koefoedi*, 112 mm SIO77-53. b) *S. multispinus*, 118 mm SL, SIO77-22. c) *S. calvala* new species, 93 mm SL, SIO77-47, holotype.

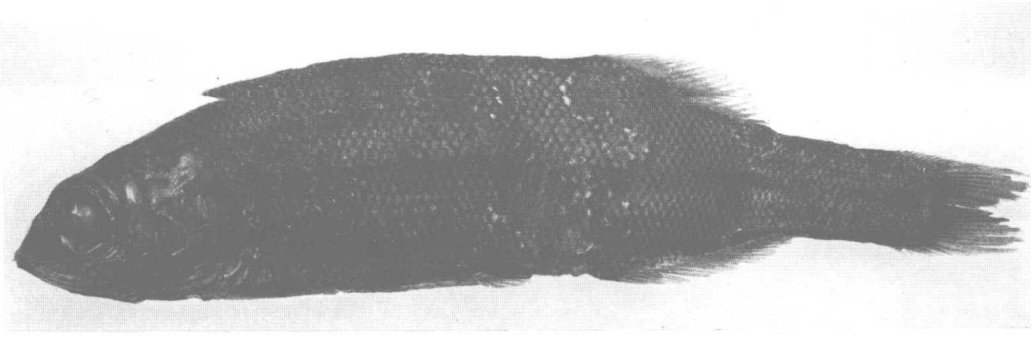

Figure 6. *Searsia koefoedi*, 113 mm SL, SIO77-22, Banda Sea.

was separated from *Searsia* primarily on the basis of the broader interspace between the premaxillary tusks, double ICO photophore and the supposed lack of the supraorbital and antorbital in *S. koefoedi*. However the difference in tusk position is one of degree rather than kind and in *S. calvala* the tusks are still closer together (compare Figs. 5a–c). Sazonov also referred to wider frontals in *S. koefoedi*, but *S. multispinus* forms an intermediate between *S. koefoedi* and *S. calvala* (Fig. 5). Further, *S. koefoedi* does have an antorbital, and we have found a small supraorbital in a stained specimen.

S. multispinus and *S. calvala* do jointly differ from *S. koefoedi* in having a single ICO and in three characters not noted by Sazonov, the presence of a GO_1, the forward extension of the cleithrum to form a spine, and the nature of the posttemporal (Fig. 7). We do not feel that these features provide sufficiently strong justification for the recognition of two genera for three otherwise closely related species.

KEY TO THE SPECIES OF *Searsia*

1a. Cleithral symphysis normal (not produced into a spine), premaxillary tusks incurved and at lateral margin of premaxillary (Fig. 5a), GO_1 absent, ICO double ..... *koefoedi*

1b. Cleithral symphysis produced into a spine, premaxillary tusks slightly incurved and about one-fourth of frontal width inward from lateral margin of premaxillary (Fig. 5b–c), GO_1 present, ICO single 2

2a. 42–43 gillrakers on 1st arch, 77–90 scales along midline, base of pectoral fin scaled, large to small sized pores (about 0.05–0.3 mm diameter) in most scalepockets over anterior half of body, fewer posteriorly, dorsal and anal origin nearly opposite (dorsal origin about 4 dorsal rays ahead of that of anal) ..... *multispinus*

2b. 29–34 gillrakers on 1st arch, about 120 scales along midline, base of pectoral fin scaleless, minute (0.01–0.05 mm diameter) pores in some of the anterior scalepockets, dorsal ahead of anal fin by one-fourth its basal length ..... *calvala* new species

Searsia koefoedi Parr 1937
Figure 6

Bathytroctes rostratus (not of Günther 1878) Brauer, 1906: 17–18, pl. 14, fig. 2–3; Koefoed, 1927: 51–53 (in part); ? Misra, 1953: fig. 9d (only).

Searsia koefoedi Parr, 1937: 8, 16–19, fig. 4, Holotype: Bingham Oceanographic Collection 3720, 69 mm SL, 23°39′N, 76°41′W, 7000 ft. wire out; Parr, 1951: 17; Tucker, 1954: 204–205 (holotype and paratype only); Grey, 1955: 269, fig. 45; Maul, 1957: fig. 1d; Nicol, 1958: 726, fig. 4; Parr, 1960: 58, fig. 37–42; Kotthaus, 1963: 102; Krefft, 1963: 83; 1966: 176; Badcock, 1970; 1035, 1041; Kotthaus, 1972: 6, fig. 3; Krefft, 1973: 95; Golovanj, 1976: 299; Parin, 1976: 197; Sazonov, 1976b: 68, figs. 10–11.

Searsea koefoedi Maul, 1948: 12–14, fig. 3; Albuquerque, 1954–56: 230, fig. 127.

Searsia koefoedi koefoedi Parr, 1960: 60–61, fig. 43; Geistdoerfer et al., 1971a: 1178; 1971b: 364.

Searsia koefoedi primicrops Parr, 1960: 61–62, fig. 43.

Diagnosis.—A *Searsia* with 27–30 gillrakers, double infracaudal organ (ICO), and the cleithral symphysis not produced into a spine. GO_1 absent. Ventral part of the posttemporal bone with a canal for reception of the cephalic lateralis (Fig. 7a). Dorsal origin only slightly ahead of that of anal.

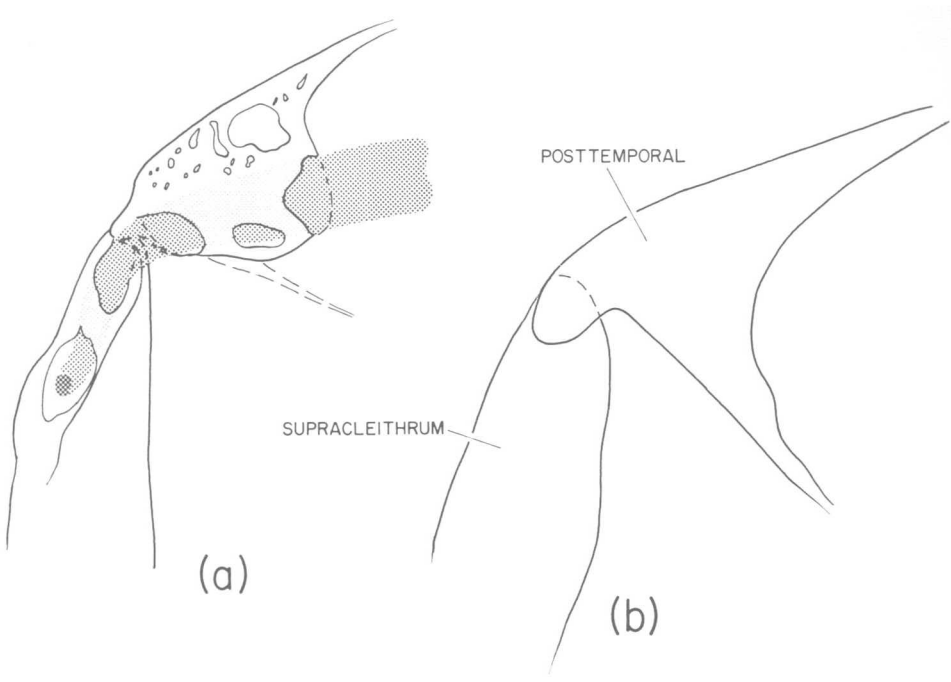

Figure 7. Camera lucida drawings of the right side posttemporal and the supracleithrum of *Searsia*. a) *S. koefoedi*, 107 mm SL, SIO77-53. b) *S. multispinus*, 118 mm SL, SIO77-22. Stippled area in *S. koefoedi* depicts the approximate path of the canal of the cephalic ateralis.

Posterior margin of maxillary at about posterior margin of pupil to posterior margin of eye. Maxillary about equal in depth to supramaxillaries and slightly convex ventrally. Supramaxillaries mostly covered by infraorbitals. A short row of 4–5 teeth on external lateral face of dentary in young stages, usually lacking in larger individuals. Supraorbital rudimentary or lacking. Pectoral base scaled.

Description.—Body moderately deep, greatest body depth about 4–5 in SL. Cleithral symphysis not produced into a spine. Dorsal and anal fins subequal and nearly opposed, dorsal origin slightly before that of anal. Head relatively short, about 4 in SL. Frontals flaring outward posteriorly and converging anteriorly over eye. Supraorbital rudimentary or absent (a small supraorbital was found on one side of a stained and cleared specimen).

Premaxillary tusks incurved and separated by nearly the width of mouth (Fig. 5a). Truncated space between the tusks edentulous. Premaxillary teeth lateral. Maxillary slightly convex, extending variably from a point behind mideye to below posterior margin of eye. Supramaxillaries as deep or deeper than maxillary and nearly completely overlapped by infraorbital bones. A short row of 4–5 mid-dentary teeth on each mandible in young. Two small vomerine teeth. Palatines edentulous. Mesopterygoid and basibranchial toothed. Teeth along edge of narrow basihyal, forming a circle. Infrapharyngeal teeth on 2nd to 4th arch.

Body flattened ventrally. Following photophores present: BRO, PO, a fairly long transverse THO (Fig. 8a), a round or a short transverse MVO, SVO, SAO, PAO, small OPC, and a double ICO. The SVO are dorsal to the base of the pelvic fins, and the PAO and SAO are a short distance

lateral to the anal fin. A small IVO is present in the young, and is the only photophore in the young, but there is no trace of it in specimens larger than 100 mm SL. The GO_2 position is marked by a transparent membrane but the organ is rudimentary. Similar transparent spots are found at the positions of the POO and posterior IOO. An SBO appears late next to the dorsalmost BRO and may complement the BRO but it is probably rudimentary as it appears to be covered by pigmented skin. GO_1 lacking.

Scales small, 77–88 along midline. Most scales over anterior half of body with pores in scalepockets. Pores measuring about 0.05–0.3 mm diameter and somewhat fewer in number posteriorly. Lateral line marked by black papillae anteriorly and neuromasts posteriorly. The cephalic lateral line system consists of the following elements: supraorbital canal, infraorbital canal, preoperculomandibular canal, postocular commissure, supratemporal canal, and the cephalic lateralis. The canals are well branched and in tubes or grooves of hard and soft tissue. The supraorbital canal intersects the supratemporal canal, which is complete, but not the infraorbital canal. The cephalic lateralis passes posteriorly into a ventral canal on the posttemporal, then runs down along the posterior margin of the supracleithrum (Fig. 7a) before joining the body lateralis.

A thin crescent-shaped antorbital along upper posterior edge of nasal capsule. Nasal rosette with 7 to 10 small lamellae. Medial rakers 4–5 on 1st and 2nd arch, lacking on ceratobranchial. All elements of 3rd and 4th arch with medial rakers. Dorsal margin of gill slit on level with mideye.

D 18–20, A 16–18, P_1 20–24, P_2 6–8 (usually 7), vertebrae 22–25 + 22–24 (46–47), Br 8 (one with 6/7), GR 7–9 + 1 + 19–21 (27–30).

Distribution.—Most captures have been near the equator in the Pacific and Indian Oceans. One record at 14°37′N, 119°52′W in the eastern Pacific. Near Indonesia and the Philippine Islands recorded from 8°50′S, 129°57.0′E with northernmost sample at 14°49′N, 119°32′E. In the Atlantic recorded from the North Atlantic from 11°N (USNM 206896) to 65°N (Krefft, 1966). Appears to have a wide depth range, being taken in nets sampling from 500 to as much as 2000 m in (estimated) depth.

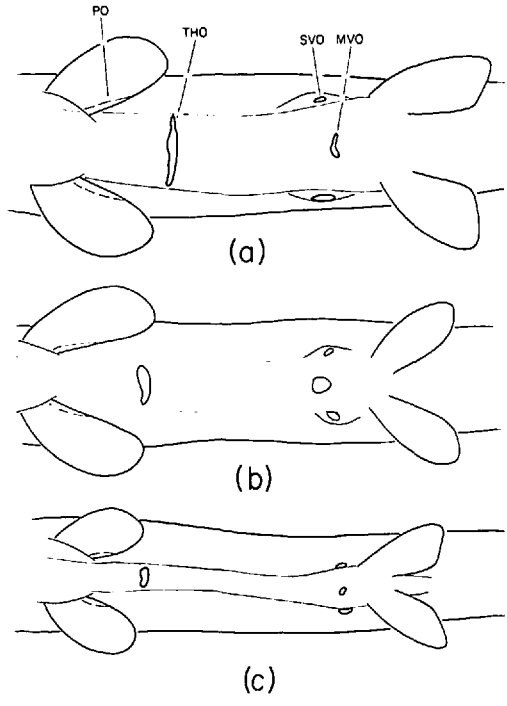

Figure 8. Camera lucida drawings showing THO, SVO, and MVO photophores in *Searsia*. PO and pectoral and pelvic fins drawn in freehand. a) *S. koefoedi*, 98 mm SL, SIO77-53. b) *S. multispinus*, 99 mm SL, SIO77-34. c) *S. calvala* new species, 93 mm SL, SIO77-47, holotype.

Material examined.—SIO52-338 (1), SIO70-346 (1), SIO71-182 (1), SIO77-53 (1), USNM 206896 (5), USNM 206873 (5), USNM 50795 (1).

Searsia multispinus (Sazonov 1977)
Figure 9

Searsioides multispinus Sazonov, 1977: 55–58, 1 fig. Holotype: No. 42626 Zoological Institute, Academy of Sciences, USSR, Leningrad, 90 mm SL, 7°55′N, 142°21′E, 1500–0 m depth of sampling.

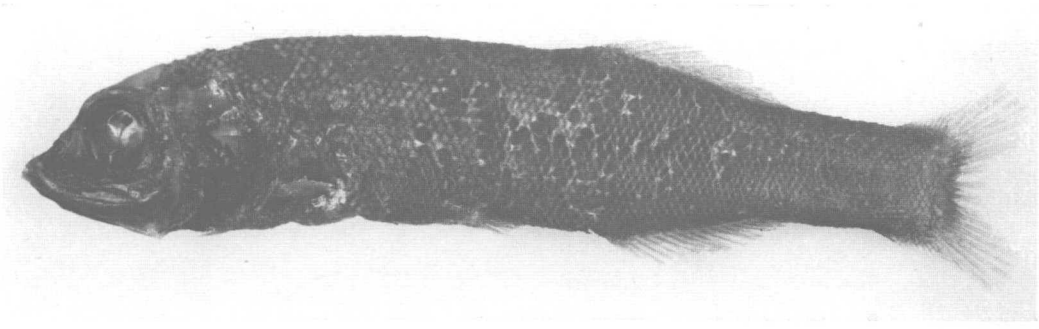

Figure 9. *Searsia multispinus* 118 mm SL, SIO77-22, Banda Sea.

Diagnosis.—A *Searsia* with about 40 gill-rakers on first arch, a single infracaudal organ (ICO), and the cleithral symphysis with a forward directed spine. GO_1 present. No lateral line canal on posttemporal bone. Dorsal and anal fins nearly subequal and opposite. Mouth large, maxillary ending behind eye in adult. Maxillary depth about 1.5 times that of supramaxillary, and ventrally curved. Supramaxillaries exposed, not covered by infraorbitals. Row of teeth on lateral face of mid-dentary relatively long. A small supraorbital bone present. Pectoral base scaled.

Description.—Counts and measurements of SIO material are in Table 2. Body shallow, greatest depth 4.6–5.9 in SL, and with little taper; depth of caudal peduncle 1.6–2.5 in greatest body depth. Body compressed, greatest width just behind pectorals, twice into depth. Head length 2.9–3.8 in SL. Eye length about 3 in head. Maxilla extends to just behind orbit in largest specimen (118 mm SL) and to middle of eye in the smallest (29 mm). Maxillary deeper than supramaxillary by about half the depth of supramaxillary. Snout 3.4–3.7 in head, slightly shorter than eye length. Outline of skull when viewed from above expanded behind eye, almost parallel over eye, then tapering sharply to snout (Fig. 5b). Frontals cupped dorsad over eye. The small, splint-like supraorbital connects with the elongated antorbital by ligaments. Nasal rosette with 8 lamellae.

Dorsal and anal fins closer to caudal base than tip of snout by a distance about equal to their basal length. Fleshy bases of both fins slightly elevated above body profile. Dorsal origin over anus, anal origin opposite fourth dorsal ray. Pelvics inserted midway between tip of snout and base of caudal. Pectorals low on body. Gill opening wide, dorsal margin in line with mideye.

Premaxillary with 6–12 teeth and an anteriorly directed tusk (tooth counts are on specimens larger than 50 mm SL; counts generally higher with increase in size). The tooth nearest to tusk enlarged but down-curving. Maxillary convex ventrally, with a single row of as many as 90 small teeth along edge of jaw. An outer incomplete row of about 7–13 slightly enlarged (mid-dentary) teeth borne on the edge of the horizontally expanded upper surface of the dentary. Vomer edentulous in largest specimen but toothed in all others, with the vomerine teeth smaller and more anteriorly located in larger specimens. Basihyal teeth varying from about 5 small teeth along the outer edge of basihyal and 2 medial rows of about 6 teeth to a more randomly scattered pattern with as few as a single pair. One or two uneven rows of up to 15 mesopterygoid teeth on a side. Several teeth on basi-branchial. Palatines edentulous in larger specimens but with teeth (at most 1 + 1) in some of the smaller ones. Infrapharyngeal teeth on 2nd–4th arch, ceratobranchial of 5th arch with several teeth.

About 5 medial rakers on epibranchial

Table 2. Measurements, in millimeters, and counts of *Searsia multispinus*

Measurement or count	SIO77-22	SIO61-32	SIO61-32	SIO61-32	SIO61-32	SIO77-16
SL	118	106	58	44	29	74
Head	33	30	19	15	9.0	24
Upper jaw	22	20	11	8.5	5.0	14
Eye	10	10	6.0	5.0	3.0	8.6
Interorbital	8.0	7.5	3.5	3.0	1.5	6.0
Snout	9.0	9.0	5.5	4.5	3.0	6.5
Preanal	80	70	35	28	19	48
Prepelvic	59	55	28	22	16	37
Predorsal	79	63	37	28	18	49
Anal base	20	19	11	7.5	5.0	13
Dorsal base	20	20	10	8.0	5.0	14
Length caudal peduncle	23	21	12	9.0	5.0	14
Depth at angular	20	19	10	7.0	5.0	14
Depth at pelvic	23	19	9.0	6.0	3.0	13
Depth caudal peduncle	14	12	6.0	—	2.0	7.5
Greatest depth	25	22	12	7.5	5.0	16
Dorsal	16	19	19	18	18	19
Anal	15	17	17	16	16	17
Pectoral	20/20	20/21	—	—	—	–/20
Pelvic	8/8	8/8	9/–	—	—	8/8
Branchiostegals	8/8	7/–	8/8	—	8/–	8/8
Gillrakers	12 + 1 + 32	10 + 1 + 29	11 + 1 + 29	9 + 1 + 28	7 + 1 + 24	11 + 1 + 30
Vertebrae	24 + 21	24 + 22	—	—	—	23 + 22
Scales along midline	80	76	78	—	—	77

Measurement or count	SIO77-21	SIO77-23	SIO77-30	SIO77-34	SIO77-35	SIO77-45
SL	113	53	92	99	45	104
Head	30	18	27	29	14	31
Upper jaw	20	9.5	17	18	7.6	20
Eye	10	6.2	10	10	5.0	10
Interorbital	8.0	3.0	5.5	6.6	2.2	7.5
Snout	8.5	5.0	7.4	8.0	4.0	9.0
Preanal	72	35	61	65	29	68
Prepelvic	55	27	48	50	23	51
Predorsal	71	33	56	59	28	69
Anal base	19	5.5	14	19	7.0	18
Dorsal base	22	8.6	18	19	7.0	21
Length caudal peduncle	23	12	18	18	8.7	22
Depth at angular	19	9.1	16	18	7.2	19
Depth at pelvic	22	7.0	16	18	5.0	17
Depth caudal peduncle	13	4.5	9.5	11	4.7	10
Greatest depth	22	9.1	18	20	7.8	21
Dorsal	18	17	18	19	17	17
Anal	16	15	16	18	16	16
Pectoral	–/20	–/19	–/21	21/21	–/21	–/21
Pelvic	9/8	–/8	9/9	8/8	–/8	8/8
Branchiostegals	8/8	8/8	8/8	8/8	8/8	8/8
Gillrakers	11 + 1 + 30	10 + 1 + 32	11 + 1 + 32	11 + 1 + 30	10 + 1 + 30	11 + 1 + 30
Vertebrae	23 + 23	—	23 + 23	23 + 22	—	22 + 23
Scales along midline	80	—	81	80	—	81

and hypobranchial of 1st and 2nd arch. Ceratobranchial of 1st and 2nd arch without medial rakers. Rakers on entire medial side of 3rd and 4th arch. Gill filaments short, and united by a membrane for about one-half their length, unpaired at angle on first two arches. A few pseudobranchial filaments. Four flattened branchiostegal rays on outer surface of epihyal, three or four acinaciform on the ceratohyal.

Photophores present are: GO_1, BRO, PO, transverse THO (Fig. 7b), circular MVO, SVO, SAO, PAO, and a single ICO. The only photophore present in an individual of 28 mm SL (SIO77-35) is a small IVO. A rudimentary GO_2 marked by a round transparent spot appears at about 30 mm SL and disappears by about 100 mm SL.

Entire body scaled, as are bases of median fins and pelvics and pectorals. Head naked. Lateral line scales normal. Black papillae anteriorly along lateral line and neuromasts posteriorly. Pores measuring 0.05–0.3 mm in diameter in the floor of most scalepockets over the anterior half of body and fewer posteriorly. Pores most prominent just behind pectoral girdle.

Cephalic lateral line system consists of supraorbital canal, infraorbital canal, preoperculomandibular canal, postocular commissure, supratemporal canal, and cephalic lateralis. The supraorbital canal does not intersect with the infraorbital canal and the supratemporal canal is not complete. Infraorbital bones consist mostly of tubules with the 3rd infraorbital, which is the largest, not reaching the preoperculum. Cephalic lateralis crosses over supracleithrum in soft tubule to the body lateralis and not through a canal or groove in the shoulder girdle.

Distribution.—SIO samples from the Banda Sea, Halmahera Sea and over the Java Trench. Caught mostly in nets sampling at about 600–1000 m depth. The holotype and one of the paratypes from the West Caroline Basin and the other paratype from the Indian Ocean (9°S, 91°E).

Material examined.—SIO61-32, 4(29–106 mm), 10°10.0′S, 115°17.2′E; SIO77-16, 1(74 mm), 4° 39.1′S, 129°53.7′E; SIO77-21, 1(113 mm), 4°40.4′ S, 129°39.0′E; SIO77-22, 1(118 mm), 4°45.6′S, 129°51.2′E; SIO77-23, 1(53 mm), 4°50.2′S, 129° 46.3′E; SIO77-30, 1(92 mm), 4°57.5′S, 129°51.0′ E; SIO77-34, 3(32–99 mm), 4°52.0′S, 129°50.0′E; SIO77-35, 2(28–45 mm), 5°03.5′S, 129°41.0′E; SIO77-45, 1(104 mm), 4°58′S, 129°59.5′E.

Searsia calvala new species
Figure 10

Diagnosis.—A *Searsia* with 29–34 gillrakers on first arch, a single infracaudal organ (ICO), and the cleithral symphysis with a forward-directed spine. A small GO_1 present. No lateral line canal on posttemporal bone. Dorsal origin ahead of that of anal by about a fourth of its length. Mouth large, posterior margin of maxillary behind eye. Maxillary slightly shallower than posterior supramaxillary and strongly convex ventrally. Supramaxillaries exposed, not covered by infraorbitals. A row of 8–10 teeth on external lateral face of dentary. A small supraorbital bone present. Pectoral base and adjacent area scaleless.

Description.—Counts and measurements of holotype and paratypes are in Table 3. The description is of the holotype and the paratypes agree, unless otherwise indicated. Body slender, greatest depth at cleithrum (5.8 in SL) with little taper, least depth of caudal peduncle 2.1 in greatest body depth. Body moderately compressed, greatest width behind pectoral, 2 in greatest depth. Head length 3.3 in SL. Snout (3.5 in HL) shorter than eye length (3.1 in HL). Maxillary extending to just behind eye, shorter in the three paratypes. Eye below head outline. Frontals when viewed from above expanded behind eye, parallel over the eye, then tapering gradually to snout (Fig. 5c). A narrow, very thin supraorbital over anterior third of eye. An elongated antorbital borders the posterior margin of nasal sac and extends dorsally toward supraorbital but does not contact it. Infraorbitals mostly tubular but with a lamellar extension partially covering posterior supramaxilliary. Posterior supramaxillary extends nearly to anterior margin of eye.

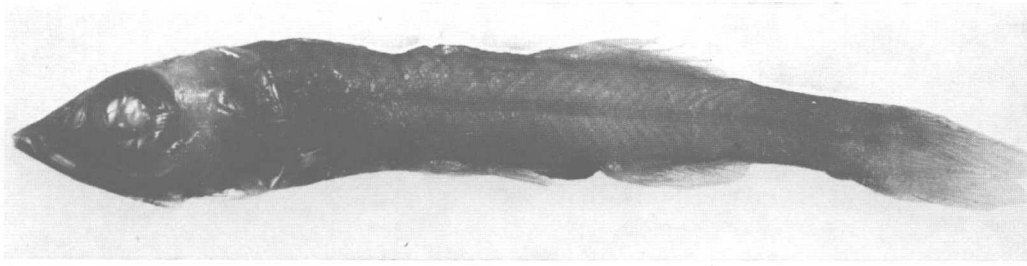

Figure 10. Holotype of *Searsia calvala* new species 93 mm SL, SIO77-47, Halmahera Sea.

Each premaxillary with 13 teeth and a horizontally directed tusk. The two teeth nearest the tusk enlarged. Edentulous space between tusks about a third the width of mouth (Fig. 5c). Anterior tip of tusks curved slightly inward and ventrad. Maxillary deep, ventrally convex, with 82 close set teeth on right side. Thirty smaller sized teeth on right dentary. Eight mid-dentary teeth on each side in a row running from symphysis to a point below posterior quarter of premaxillary. Vomer with 2 teeth, and a tooth on each palatine. Teeth along border of basihyal, forming a circle. Basibranchial teeth in a single row except for double row at about the 2nd arch. Several teeth on mesopterygoid. Infrapharyngeal teeth on arches 2–4. Dentition of paratypes similar but due to smaller size there are fewer premaxillary, maxillary and dentary teeth, and more basihyal and mid-dentary teeth. The basihyal dentition of the paratypes consists of three pairs with a medial tooth posteriorly and 1–4 medial teeth anteriorly.

Table 3. Measurements in millimeters, and counts of the type material of *Searsia calvala* (all SIO77-47; first column is the holotype)

SL	93	77	54	49
Head	28	24	18	16
Upper jaw	17	15	11	9.7
Eye	9.0	8.6	6.0	6.0
Interorbital	4.1	3.7	2.5	2.6
Snout	8.0	7.0	5.2	4.5
Preanal	63	52	36	34
Prepelvic	49	41	29	27
Predorsal	60	48	34	31
Anal base	12	12	7.0	7.0
Dorsal base	16	14	9.5	7.4
Length caudal peduncle	17	15	10	9.5
Depth at angular	16	13	9.0	7.5
Depth at pelvic	12	8.5	6.5	4.8
Least depth caudal peduncle	7.5	6.5	4.0	3.2
Greatest depth	16	13	9.0	8.0
Dorsal	18	17	17	16
Anal	15	15	16	15
Pectoral	20/20	20/20	19?	20?
Pelvic	9/9	8/9	8/8	8/8
Branchiostegals	8/8	8/8	8/8	8/8
Gillrakers	8 + 1 + 24	9 + 1 + 24	7 + 1 + 21	7 + 1 + 22
Vertebrae	26 + 21	25 + 20	—	—
Scales along midline	120	—	—	—

Photophores on or close to venter. Flattened area on venter very narrow (Fig. 8c), with hardly any flattening behind pelvic fins. Following photophores present: GO_1, BRO, PO, short transverse THO (Fig. 8c), round MVO, SVO, SAO, PAO, and single ICO. A very small IVO is present in the 54 mm SL paratype but absent in the holotype. A strip of white tissue extends from the GO_1 to the GO_2 position. However, the GO_2 is lacking in all specimens examined. A longitudinal JO once present on the holotype has faded without a trace and is considered rudimentary. The SVO lies at the anterior base of the pelvic fins and the SAO, and PAO near the base of anal fin. OPO lacking, but opercular area abraded and slightly damaged in our material.

Scales along midline unmodified, numbering approximately 120. Lateral line marked by black papillae anteriorly and by neuromasts posteriorly. Scalepockets on anterior part of body with minute pores. Area around pectoral base scaleless, as are the head and opercles. All paratypes lacking scales owing to their small size.

Because of the small size of our specimens, the cephalic lateral line canals are difficult to discern. The supraorbital canal runs from the anterior margin of the nasal to the supratemporal canal, and is not jointed to the infraorbital. Infraorbital canal extends from the lacrimal to the postocular commissure. Both supratemporal canal and cephalic lateralis lacking ossification. The cephalic lateralis passes posteriorly between the posttemporal and the supracleithrum, without any canal through them.

Dorsal fin origin behind midlength by over an eye length; pelvic fins just behind midlength. Dorsal origin ahead of that of anal by a third its basal length (8–10 rays) with the posteriormost ray about 4 rays ahead of that of anal. Dorsal less advanced in smaller paratypes, being ahead by about a fourth of basal length.

Bases of anal and dorsal fins raised above body outline. Cleithral symphysis produced into an anteriorly directed spine, the exposed part medially split. However this is probably due to damage, as it is not split in some of the paratypes.

Derivation of name.—From the Latin *calvus*, bald, and *ala*, upper part of arm, in reference to the unscaled pectoral base.

Distribution.—Known from one station in the Halmahera Sea.

Material examined.—Holotype: SIO77-47, 93 mm SL, ALPHA HELIX station 121, Halmahera Sea, 0°41.7′S, 128°55.7′E, 1000–1400 m sampling depth, in a 1 RMT-8, on May 16, 1975 by B. Robison.

Paratypes: 3 specimens (77 mm, 54 mm, 49 mm) collected with the holotype, and bearing same collection number.

Other material: 7 smaller specimens collected with holotype and paratypes.

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ADDRESS: *Scripps Institution of Oceanography, University of California San Diego, La Jolla, California 92038.*